

## PM 511a: Data Analysis

Units:	4
Term:	Spring 2018
Time:	Tu 1-3pm Lecture; 11am-1pm Lab1; 3-5pm Lab2
Location:	USC HSC, Soto Building 115/116
Instructor:	Meredith Franklin, Ph.D.
TA (Lab):	TBD
TA (Grader):	TBD
Office:	SSB 202A
Office Hours:	By Appointment
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### Course Description

This course will employ example data sets as a basis for introducing rigorous methods of statistical analysis, with a focus on linear regression models for quantitative (continuous) outcomes. Exploratory data analysis, estimation, hypothesis testing, assessing model assumptions, building multivariate models, and prediction will all be covered. The course also provides an introduction to the Statistical Analysis System (SAS) software, and students will become proficient in the use of SAS for managing and analyzing complex data sets.

### Learning Objectives

Through this course, students will become familiar with data analysis and linear regression using SAS. We will cover:

- Example data sets, goals of data analysis, types of studies, types of variables, introduction to SAS
- Basic statistics, random variables and distributions, estimation, hypothesis testing
- Introduction to linear regression, the linear model, finding the best fitting line, interpreting intercept and slope estimates, testing hypotheses and forming confidence intervals, assessing model assumptions, programming concepts
- Interpreting parameter estimates from transformed data, computing predicted values, the correlation coefficient
- Categorical independent variables, splines
- The multiple regression model, hypothesis testing, evaluating model assumptions
- PROC GLM vs. PROC REG, multiple and partial correlations
- Interaction and confounding
- Regression diagnostics, residual analysis, detection of outliers, collinearity, scaling X variables
- Model selection
- Analysis of variance (ANOVA), 1-way design, the F-test, multiple comparisons
- Factorial designs, repeated measures, split plot analysis using mixed models
- Analysis of covariance (ANCOVA), general approaches to nonparametric analysis

**Prerequisite(s):** PM510 or equivalent

### **Course and Lab Notes**

Lecture notes presented in class will be posted on Blackboard. Lab notes will also be posted on Blackboard. It is mandatory that you bring a laptop to lab to complete the lab assignments.

### **Technological Proficiency and Hardware/Software Required**

SAS will be used extensively in this course. A good reference is:

- Delwiche & Slaughter (2012) *The little SAS Book: A Primer* (5<sup>th</sup> ed.), SAS Institute.

### **Required Readings and Supplementary Materials**

Required text:

- Kleinbaum, D. G., Kupper, L. L., Nizam, A., & Rosenberg, E. S. (2014). *Applied Regression Analysis and Other Multivariable Methods*. (5<sup>th</sup> ed.). Cengage Learning.

### **Description and Assessment of Assignments**

***Homework:*** There will be 6 homework assignments. Homework must be submitted in electronic form on Blackboard. **Please allow yourself enough time to complete the homework assignments. Each homework assignment is expected to take between 10-20 hours to complete.**

***Homework Quizzes:*** Every homework will also include a homework quiz that consists of questions that are in the homework. The quiz is timed, and you only get one attempt. The quiz is administered through Blackboard. It is due at the same time as the homework, but you should complete the homework assignment before attempting the homework quiz.

***In-Class Quizzes:*** There will be two 15-minute in-class quizzes. These quizzes are closed book and will begin promptly at the start of class.

***Midterm Exam:*** The midterm exam will take place during lecture time on week 9 of the course. It will be closed book, and will be 2 hours long, beginning promptly at the start of the class. There will be no lab that week. The midterm will test material that has been covered up to and including the lecture in the week prior to the exam.

***Final Project:*** The final project has two components: a take-home part and an in-class part. The take home part will be handed out the last week of class and is due at the scheduled final exam period for this class. The in-class component will take place during the scheduled final exam time. This project will cover topics from the entire course.

## Assignment Submission Policy

Assignments shall be submitted on Blackboard. No late assignments will be accepted, except when verifiable extenuating circumstances can be demonstrated. For the take-home portion of the homework, students may discuss the problems and strategies with one another. However, *individual solutions must be submitted and students must complete the homework quiz without any assistance*. Copying will not be tolerated, and this course has a zero-tolerance policy for cheating of any kind. *Any evidence of shared written work, programming code, or other form of cheating will result in zero credit for all students involved*, and submission of a complaint to USC's Student Judicial Affairs and Community Standards (SJACS) committee. For the final project, all work must be your own (no discussing problems or strategies with anyone else). Detection of any copying or shared work will result in zero credit for all students involved.

## Grading Breakdown

<b>Assignment</b>	<b>% of Grade</b>
Homework (6)	5%
Homework Quizzes (6)	15%
Labs (weekly)	10%
Midterm Exam	25%
In-Class Quizzes (2)	5%
Final Project	40%
TOTAL	100%

<b>Grade</b>	<b>Range</b>
A	93.0% or higher
A-	90.0%-92.9%
B+	87.0%-89.9%
B	83.0%-86.9%
B-	80.0%-82.9%
C+	77.0%-79.9%
C	73.0%-76.9%
C-	70.0%-72.9%
D	60.0%-69.9%
F	59.9% or lower

## Course Schedule: A Weekly Breakdown

	Lecture Topics	Lab Topics	Due Dates
<b>Week 1</b> January 9	Approaching data analysis	Introduction to SAS	<b>HW1 Assigned</b>
<b>Week 2</b> January 16	Probability distributions and hypothesis testing	SAS data input and basics	
<b>Week 3</b> January 23	Introduction to linear regression	Manipulating datasets in SAS, regression in SAS	<b>HW 1 DUE HW2 Assigned</b>
<b>Week 4</b> January 30	Assessing assumptions of linear regression, correlation, the ANOVA table	SAS reports, libraries, conditioning statements	
<b>Week 5</b> February 6	Regression with categorical predictor variables, splines	Appendix of SAS functions, review regression, correlation	<b>HW 2 DUE HW3 Assigned</b>
<b>Week 6</b> February 13	<b>In-Class Quiz 1</b> Multiple linear regression	Multiple regression and correlation in SAS	
<b>Week 7</b> February 20	Scaling regression coefficients, partial regression and correlation	Partial regression and correlation in SAS	<b>HW 3 DUE HW4 Assigned</b>
<b>Week 8</b> February 27	Confounding and interaction	Assessing confounding and interaction in SAS	
<b>Week 9</b> March 6	Midterm	No Lab	<b>HW 4 DUE</b>
<b>Spring Break</b> March 13	<b>No Class</b>	<b>No Lab</b>	
<b>Week 10</b> March 20	Multiple regression residual diagnostics, collinearity		<b>HW5 Assigned</b>
<b>Week 11</b> March 27	Model selection		
<b>Week 12</b> April 3	Analysis of variance (ANOVA)	SAS macros	<b>HW 5 DUE HW6 Assigned</b>
<b>Week 13</b> April 10	<b>In-Class Quiz 2</b> Analysis of covariance (ANCOVA), non-parametric ANOVA	Estimation of sample size and power	
<b>Week 14</b> April 17	Analysis of binary outcomes, logistic regression	Analysis of binary outcomes	<b>HW 6 DUE</b>
<b>Week 15</b> April 24	Review Final Project Released	Final Project Released	
<b>Week 16</b> <b>May 8</b>	<b>Take Home Final Project Due and In-Class Final Project Component</b>		

## Statement on Academic Conduct and Support Systems

### Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, “Behavior Violating University Standards” <https://policy.usc.edu/scampus-part-b/>. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

### Support Systems:

*Student Counseling Services (SCS) - (213) 740-7711 – 24/7 on call*

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. <https://engemannshc.usc.edu/counseling/>

*National Suicide Prevention Lifeline - 1-800-273-8255*

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. <http://www.suicidepreventionlifeline.org>

*Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-4900 - 24/7 on call*

Free and confidential therapy services, workshops, and training for situations related to gender-based harm. <https://engemannshc.usc.edu/rsvp/>

*Sexual Assault Resource Center*

For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: <http://sarc.usc.edu/>

*Office of Equity and Diversity (OED)/Title IX compliance – (213) 740-5086*

Works with faculty, staff, visitors, applicants, and students around issues of protected class. <https://equity.usc.edu/>

*Bias Assessment Response and Support*

Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. <https://studentaffairs.usc.edu/bias-assessment-response-support/>

*The Office of Disability Services and Programs*

Provides certification for students with disabilities and helps arrange relevant accommodations. <http://dsp.usc.edu>

*Student Support and Advocacy – (213) 821-4710*

Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. <https://studentaffairs.usc.edu/ssa/>

*Diversity at USC*

Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. <https://diversity.usc.edu/>

*USC Emergency Information*

Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible, <http://emergency.usc.edu>

*USC Department of Public Safety – 213-740-4321 (UPC) and 323-442-1000 (HSC) for 24-hour emergency assistance or to report a crime*

Provides overall safety to USC community. <http://dps.usc.edu>